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### Oxygen Reserve Index (ORI): Validation of a new variable

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**Background:** Monitoring a patient's oxygen status during anaesthesia using pulse oximetry is essential. However, pulse oximetry is limited in the normoxic and hyperoxic range, when oxygen saturation is >97%. In this range, the new Oxygen Reserve Index (ORI), a relative indicator of the partial pressure of oxygen in arterial blood (PaO<sub>2</sub>) in the range of 100 to 200 mmHg, may serve clinicians as an early warning of an impending hypoxic state.<sup>1</sup>

**Methods:** 20 healthy volunteers (age 24±6 yr, BMI 24±3 kg m<sup>-2</sup>) were breathing via a tight fitting facemask standardized oxygen concentrations ranging from mild hypoxia (FiO<sub>2</sub> 0.14) to hyperoxia (FiO<sub>2</sub> 1.0) (fig. 1, 2). ORI was measured noninvasively by multiwave pulse co-oximetry (Rainbow SET, Masimo Corp.) to differentiate between normoxic and hyperoxic states by scaling the measured absorption information between 0.00 and 1.00. These ORI values were compared with PaO<sub>2</sub> values obtained from repeated arterial blood samples. In this preliminary analysis, we examined the correlation between changes in ORI (ΔORI) and PaO<sub>2</sub> (ΔPaO<sub>2</sub>). Furthermore, we performed regression analysis to compare absolute ORI and PaO<sub>2</sub> values as well as ΔORI and ΔPaO<sub>2</sub> values, respectively.

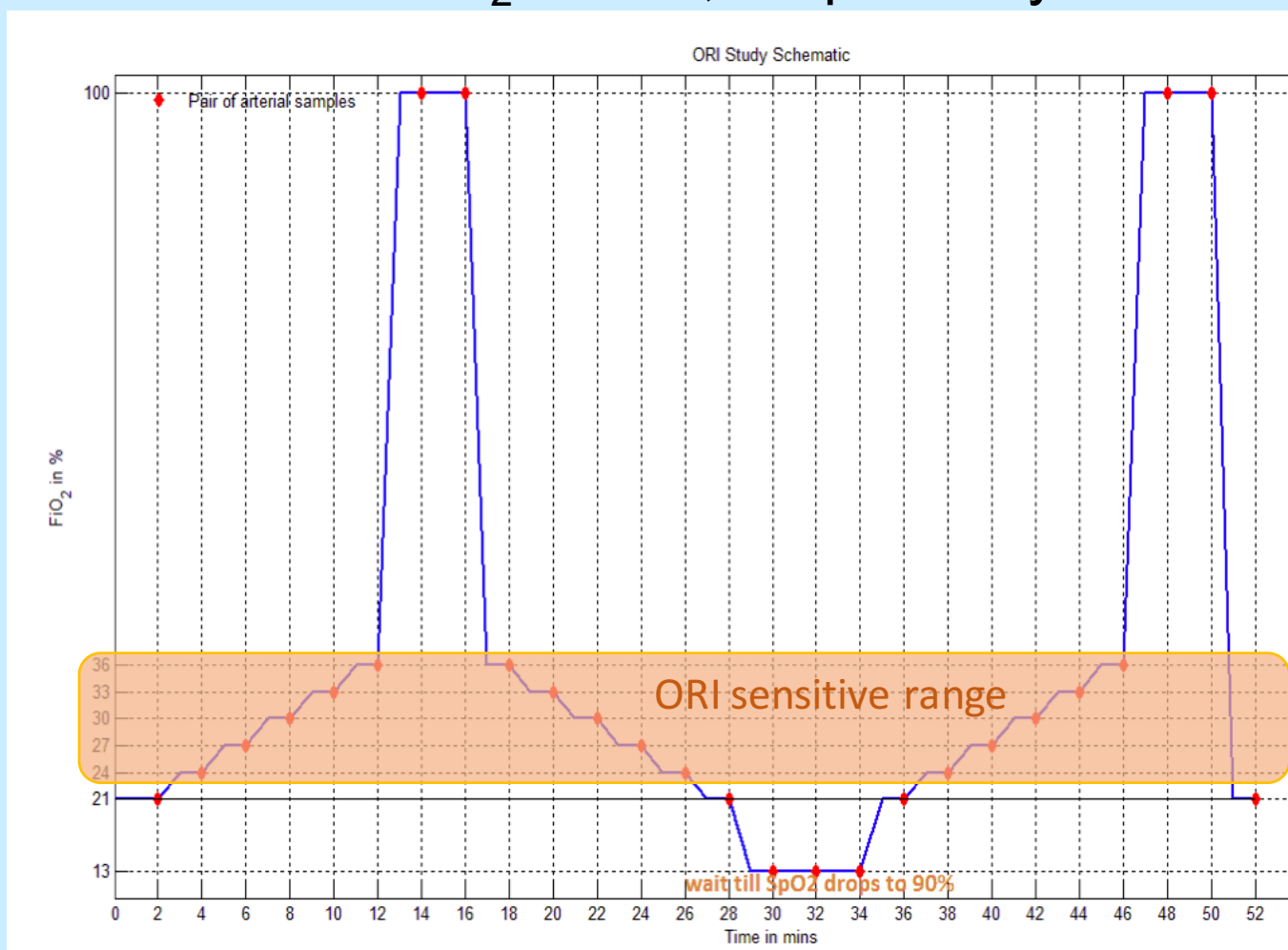


Fig. 1 Study flow chart

**Results:** Sensitivity and specificity as well as concordance of ΔORI vs. ΔPaO<sub>2</sub> were high (mostly above 90%, for details see table 1). Absolute ORI and PaO<sub>2</sub> values were positively correlated (r<sup>2</sup>=0.63; p<0.001, fig. 3A). The same holds true for ΔORI and ΔPaO<sub>2</sub> values (r<sup>2</sup> = 0.59; p<0.001, fig. 3B).

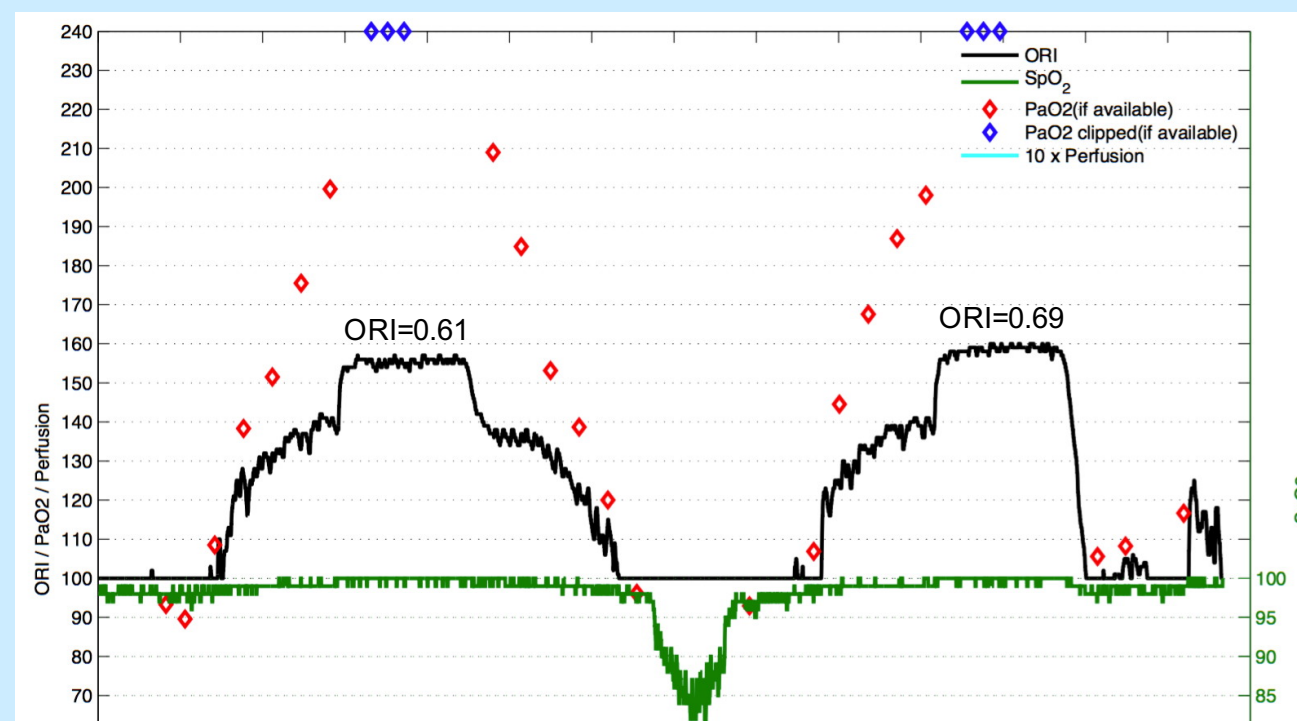


Fig. 2 Representative example

| Table 1 Sensitivity/Specificity and Concordance for ΔORI vs. ΔPaO <sub>2</sub> |             |             |             |             |
|--------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|
| PaO <sub>2</sub> ref (mmHg)                                                    | Samples [n] | Sensitivity | Specificity | Concordance |
| 110                                                                            | 710         | 80.85       | 99.25       | 98.03       |
| 120                                                                            | 892         | 95.92       | 91.24       | 92.26       |
| 130                                                                            | 941         | 91.61       | 92.85       | 92.45       |
| 140                                                                            | 1029        | 92.98       | 93.19       | 93.10       |
| 150                                                                            | 1047        | 95.82       | 91.35       | 93.70       |
| 160                                                                            | 1071        | 94.84       | 89.35       | 92.62       |
| 170                                                                            | 1088        | 94.60       | 90.89       | 93.29       |
| 180                                                                            | 1028        | 94.84       | 90.03       | 93.39       |
| 190                                                                            | 1035        | 94.83       | 85.36       | 92.27       |

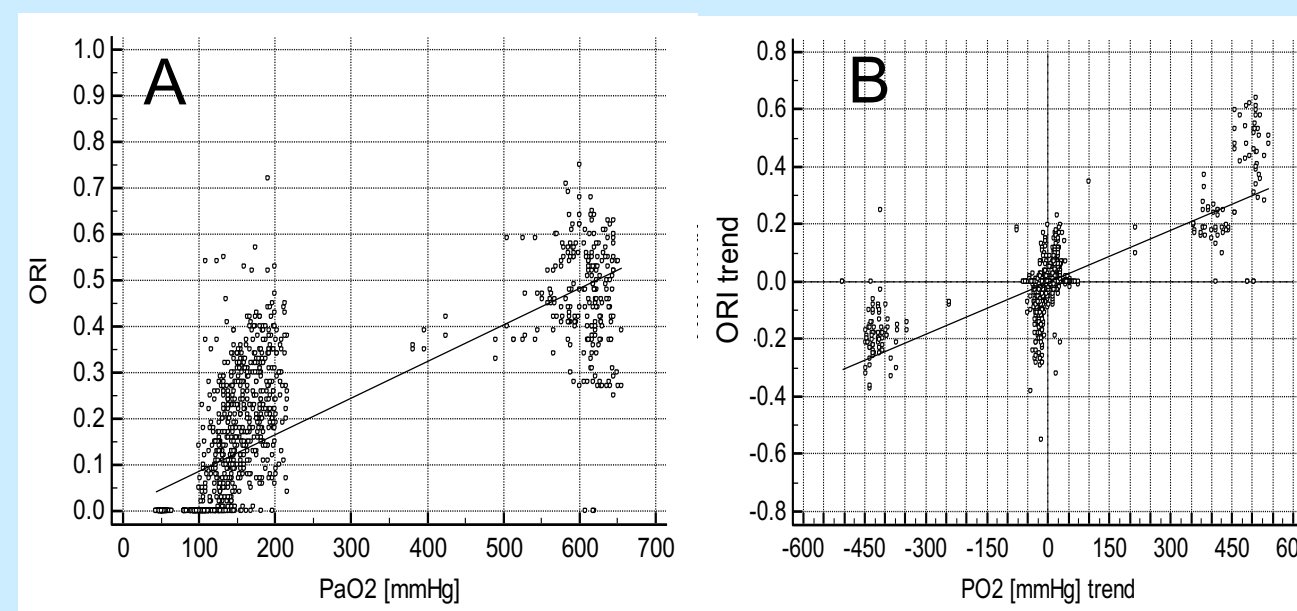


Fig. 3 Correlation of absolute values (A) and changes (trend)(B) of ORI and PaO<sub>2</sub>, respectively.

**Conclusion:** In the flat part of the haemoglobin-oxygen binding curve, where oxygen saturation is >97%, a decrease in ORI indicates a falling PaO<sub>2</sub> prior to oxygen desaturation. As such, the non-invasive and continuously available ORI may offer additional information at maximum SpO<sub>2</sub> values and help guide clinicians in estimating the body's oxygen reserve.

**Reference:** <sup>1</sup>Szmuk P, et al. Anesthesiology 2016;124:779-86  
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